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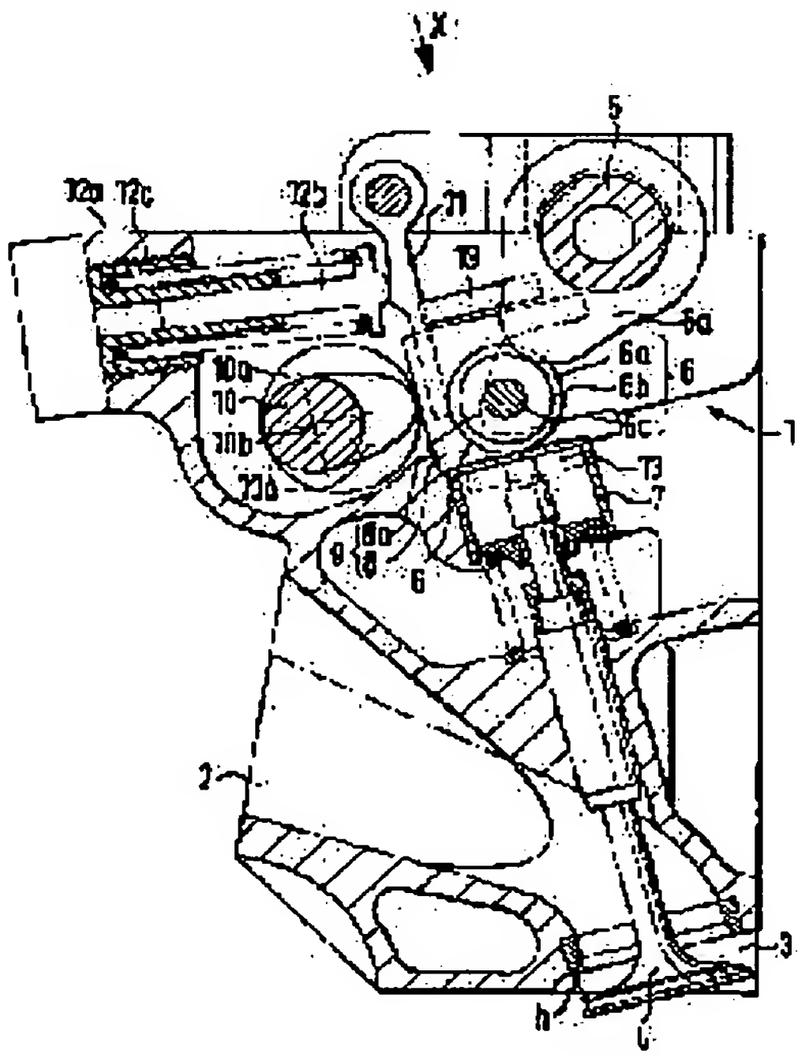
(54) VALVE GEAR ASSEMBLY FOR INTERNAL COMBUSTION ENGINE

(57)Abstract:
PURPOSE: To provide a valve gear assembly capable of adjusting a valve stroke process so as to be various and different from each other.
CONSTITUTION: This internal combustion engine is provided with at least two intake-stroke valves for each cylinder. The stroke processes of the stroke valves can be adjusted so as to be different from each other. This adjustment is made by an eccentric shaft 10. The eccentric shaft moves the supporting point of a transfer member between respective cams 5a and stroke valves 4. Both eccentric bodies 10a, 10a' attached onto the cylinder are of a different geometry from each other. The transfer member are supported by the eccentric bodies 10a, 10a' and formed by a locker lever operated by the cam 5a. The locker lever works onto a swing lever. Other transfer member includes a gate track 8a.



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CLAIMS

[Claim(s)]
[Claim 1] Equip every cylinder (14a, 14b) with at least two shuttle valves, and this shuttle valve acts on parallel mutually. And are operated by the cam (5a, 5a') and the transfer member (9, 9', 19, 19'), respectively, and it sets to the moving valve mechanism of the internal combustion engine which can adjust so that the both-way processes of a shuttle valve may differ mutually. It can adjust with the pivotable eccentric object (10a, 10a') with which the supporting point of a transfer member (9, 9', 19, 19') was prepared on the common eccentric shaft (10). The moving valve mechanism of the internal combustion engine characterized by the lift curves of at least two eccentric bodies (10a, 10a') prepared in every cylinder (14a, 14b) differing mutually.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] It has at least two shuttle valves for every cylinder, and this shuttle valve acts on parallel mutually, and this invention is operated by the cam and the transfer member, respectively, and it relates to the moving valve mechanism of the internal combustion engine which can adjust so that the both-way processes of a shuttle valve may differ mutually.
[0002]
[Description of the Prior Art] Such a moving valve mechanism is known for example, by the Federal Republic of Germany patent application disclosure No. 3739246 description. The transfer member is formed as a tilting lever in that case. Each tilting lever of the shuttle valve attached to one cylinder can be mutually connected through a clutch element. Since a cam which is different on each tilting lever is attached in the case of this well-known technical level, it is possible to operate a predetermined shuttle valve directly by suitable control of this tilting lever clutch element using the cam of other shuttle valves using the cam attached to it. The valve round trip process of this predetermined shuttle valve is changeable with it so that it may differ from the valve round trip process of other shuttle valves.
[0003] This well-known moving valve mechanism is each shuttle valve, and has the fault that only the both-way process established by the cam which exists actually can be generated. Other deformation is impossible in that case. Furthermore, the clutch element of a tilting lever or a transfer member receives very big mechanical load.
[0004]
[Problem(s) to be Solved by the Invention] Then, the technical problem of this invention is devising to the moving valve mechanism equipped with the shuttle valve which acts on two parallel a means a valve round trip process's being adjusted so that it may differ colorfully and mutually even if few per cylinder.
[0005]
[Means for Solving the Problem] In order to solve this technical problem, it can adjust with the pivotable eccentric body with which the supporting point of a transfer member was prepared on the common eccentric shaft, and the lift curves of at least two eccentric bodies established for every cylinder differ mutually.
[0006] By this invention, the supporting point of the transfer member prepared between each cam and each valve can be adjusted. or [that this transfer member is a tilting lever like an above-mentioned technical level] -- or they are a rocker lever or a swing lever. However, in addition to this, other operation forms are possible. For example, the gate element which has a gate orbit for rollers is sufficient. Migration of the supporting point of this swing lever, a tilting lever, or a gate element produces the both-way process which deformed about the shuttle valve attached, respectively. It is because it is delivered that cam strokes differ. this principle for changing a valve round trip process -- itself -- being well-known (the Federal Republic of Germany patent No. 3833540 description) -- this well-known operation form does not show how the supporting point of a transfer member is moved simply.
[0007] This is performed by the eccentric object by this invention. The transfer member is supported by this eccentric object. An eccentric object is the component of one common eccentric shaft. If two or more cylinders make a train and are prepared, this eccentric shaft is prolonged over all cylinders. This eccentric shaft is simply pivotable. In this invention, the eccentric bodies attached to the cylinder of further each differ. By it, it can adjust so that the valve attached to each eccentric body of this so that it might be wanted can be operated so that it may differ mutually, and the both-way process of a valve may be differed mutually.
[0008]

[Example] Next, based on two advantageous examples, this invention is explained in detail.
[0009] The reference figure 1 has shown an internal combustion engine's cylinder head. This cylinder head is vertically prolonged over two or more cylinders in drawing 1 to the flat surface of a drawing. At least two inhalation-of-air paths 2 leading to a combustion chamber 3 are established in each cylinder. In this case, one shuttle valve 4 is formed in each inhalation-of-air path 2 so that it may be well-known. This shuttle valve is operated by cam 5a of a cam shaft 5. Cam 5a acts on a roller 6. This roller itself rolls on the tappet 7 of a shuttle valve 4.
[0010] As shown also in drawing 3 , the roller 6 was formed in the shape of a stage, and is equipped with two or more rolling stages 6a, 6b, and 6c. Rolling stage 6a appears in a tappet 7, and, on the other hand, as for a roller 6, rolling stage 6b touches cam 5a. Since rolling stage 6c rolls the gate orbital 8a top of the gate element (fluting link element) 8, the roller 6 whole is guided along with gate orbital 8a with this gate element 8. By it, the gate element 8 and a roller 6 form the so-called transfer member 9 between cam 5a and a shuttle valve 4.
[0011] As shown in drawing, this transfer member 9 or the gate element 8 is supported by eccentric object 10a. Processing formation of this eccentric object is carried out from the eccentric shaft 10. If an eccentric shaft 10 rotates around the longitudinal axis 10b (two different locations are shown in drawing 1 and 2), the supporting point of the gate element 8 or a transfer element 9 will move. By this, the location of a roller 6 or gate orbital 8a also changes. This gate orbit guides the roller 6 moved by rotating cam 5a. By modification of the supporting point of the transfer member 9, as shown in drawing, in the same cam stroke, a different valve stroke arises. The maximum valve stroke h at the time of the maximum cam stroke is shown in drawing 1 . On the other hand, in the case of drawing 2 , 180 degrees of eccentric shafts 10 are rotating at the circumference of the longitudinal axis 10b. By sliding of the transfer member 9 produced as a result, the valve stroke of zero almost arises at the time of the maximum cam stroke. That is, the shuttle valve 4 is opened the fewest.
[0012] In order to ensure an above-mentioned function, the return lever 11 is required. Similarly, this return lever acted on rolling stage 6a of a roller 6, and has always pushed this roller against cam 5a. This return lever 11 is energized by compression spring 12a by the suitable approach. Therefore, compression spring 12a is pinched between press element 12b which acts on the return lever 11, and advice element 12c thrust into the cylinder head 1. Furthermore, the longitudinal direction guide 13 for the gate element 8 is shown theoretically.
[0013] As shown in drawing 3 , two shuttle valves 4 and 4' are prepared in each cylinders 14a and 14b of the internal combustion engine cylinder head 1. The transfer member 9 of the proper which carried out the forms of the gate element 8 of a proper, 8', and the roller 6 of a proper and 6', and 9' are attached to each shuttle valve 4 of each cylinders 14a or 14b, and 4'. [cam 5a of a proper, 5a', and] Each gate element 8 and 8' are supported by eccentric object 10a of the proper of the eccentric shaft 10 prolonged over the cylinder head 1 whole, and 10a' in that case. As shown in drawing 1 and 2, both eccentricity object 10a attached to the cylinder heads 14a or 14b differs in the configuration from 10a'. Both eccentricity object 10a of a cylinder and 10a' have only the same point of the minimum eccentricity object stroke and the maximum eccentricity object stroke. By it, when the eccentric shaft 10 was in the location shown in drawing 2 , both the shuttle valves 4 and 4' have almost been closed in spite of the maximum cam stroke. On the other hand, if the eccentric body 10 is in the location of drawing 1 , both the shuttle valves 4 and 4' will carry out the maximum disconnection at the time of the maximum cam stroke (valve stroke h). On the other hand, at the time of the maximum cam stroke, when an eccentric shaft is in the mid-position, both the shuttle valves 4 and 4' are opened so that it may differ. It is possible to change so that valve stroke progress of each cylinder 14a or both this shuttle valve 4 of every 14b, and 4' may change mutually with accommodation of an eccentric shaft 10 by it.
[0014] This is clear from drawing 4 which shows various valve stroke progress in a graph. A crank angle or a cam shaft angle is written down in an axis of abscissa, and the valve stroke which can be attained on an axis of ordinate is filled in. The affiliation location of an eccentric shaft 10 is indicated about each five valve stroke progress selected in instantiation in that case. The numeric value which, on the other hand, indicated the numeric value indicated to the ascending curve in the downward curve about the 1st shuttle valve 4 expresses the required eccentric shaft location for 2nd shuttle valve 4' in that case. The location of an eccentric shaft 10 is indicated by the include angle in that case. In this case, the location of drawing 2 is equivalent to 0 degree, and the location of drawing 1 shows the location of 180 degrees.
[0015] Like previous statement, when an eccentric shaft location is 0 degree, both the shuttle valves 4 and 4' perform very short valve stroke motion. On the other hand, when an eccentric shaft location is 180 degrees,

both the shuttle valves 4 and 4' attain the maximum valve stroke h. Although shuttle valve 4' maintains the minimum valve stroke also when eccentric shaft locations are 45 degrees and 90 degrees, in the case of this eccentric shaft location, the shuttle valve 4 is performing stroke motion which already clarified.

[0016] A valve round trip process in which two shuttle valves which act on parallel in each cylinder differ is desired in order to improve vortex-ization of the air supply into which it was put in gas exchange dynamics and a combustion chamber 3. According to the illustrated structure and other structures of explaining below, even if few, per cylinder, such a valve stroke property is simply acquired about the shuttle valve which acts on two parallel.

[0017] In the 2nd example shown in drawing 5 , the reference number 1 has shown an internal combustion engine's cylinder head. This cylinder head is also vertically prolonged over two or more cylinders to the flat surface of a drawing in the graphic display. At least two inhalation-of-air paths 2 leading to a combustion chamber 3 are established in each cylinder. In this case, the shuttle valve 4 is formed in each inhalation-of-air path 2. This shuttle valve 4 and 4' are operated by cam 5a of a cam shaft which is one respectively, and 5a'. In this case, each cam acts on a rocker lever 16 and 16'. This rocker lever itself acts on the swing lever 17 and 17'. In the swing lever 17 and 17', the fluid pressure-type play compensator 18 and 18' are supported. The shuttle valve 4 and the shaft of 4' are supported by this play compensator. The rocker lever 16 and the swing lever 17 form the transfer member 19 or 19'. By this transfer member, the stroke of cam 5a or 5a' is transmitted to a shuttle valve 4 or 4'.

[0018] The transfer member 19 or the rocker lever 16 is supported by eccentric object 10a so that clearly. This eccentric object is processed from the eccentric shaft 19. If an eccentric shaft 10 rotates to the circumference of the longitudinal axis 10b, the supporting point of a rocker lever 16 or the transfer member 19 will move. By such change of the supporting point of the transfer member 19, a valve stroke which is different by the same cam stroke arises. It is because a motion orbit which is different to the swing lever 17 at the time of the revolution of cam 5a is progressed based on the support by which the rocker lever 16 was changed, so it moves so that the swing levers 17 may also differ. the shuttle valve 4 other than the maximum valve stroke carries out the minimum disconnection especially by this -- the valve stroke of zero can almost be attained.

[0019] A rocker lever 16 is guided with the pin-slot-guide in which the whole was shown with the reference number 20. The rocker lever 16 is equipped with slot 20a so that clearly. The rocker lever is hung from pin 20b through this slot. This pin is being fixed to bearing part 20c of a cylinder. Based on this pin-slot-guide 20, a rocker lever 16 can occupy a different location. Of course, the pin-slot-guide 20 can be formed in reverse. That is, pin 20b can be fixed to a rocker lever 15, and slot 20a can be prepared in cylinder head bearing part 20c. In order to ensure the above-mentioned accommodation function, further, it returns to heel 16a of a rocker lever, and the mandril 11 is acting. This return mandril has always forced the rocker lever 16 on cam 5a and eccentric object 10a. Therefore, the return mandril 11 is energized by compression spring 12a by the suitable approach. This compression spring is supported by advice element 12c included in the cylinder head 1.

[0020] As shown in drawing 6 and 7, two shuttle valves 4 and 4' are prepared about each cylinder or combustion chamber 3 of the cylinder head 1 of an internal combustion engine. Cam 5a of a proper, 5a', and the transfer member 19 of a proper and 19' are prepared in each shuttle valve 4 and 4'. This transfer member has the rocker lever 16 of a proper, 16' and the swing lever 17 of a proper, and the form of 17'. Each rocker lever 16 and 16' are supported by eccentric object 10a of the proper of the eccentric shaft 10 prolonged over the cylinder head 1 whole, and 10a' in that case. As shown in drawing 5 , both eccentricity object 10a attached to the cylinder or the combustion chamber 3 differs in the configuration from 10a'. Both eccentricity object 10a of one cylinder or a combustion chamber and 10a' are the same only in respect of the minimum eccentric object stroke and the greatest eccentric stroke. In the location of the illustrated minimum eccentricity object stroke, both the shuttle valves 4 of one cylinder and 4' are almost closed, although a cam stroke is max. On the other hand, if it departs from a graphic display location, only 180 degrees of eccentric shafts 10 rotate and the eccentric body adjusts a rocker lever 16 and 16' based on the maximum eccentricity object stroke at that time of eccentric object 10a and 10a' by it, both the shuttle valves 4 and 4' will carry out the maximum disconnection in the case of the maximum cam stroke. On the other hand, in the mid-position of an eccentric shaft 10, both the shuttle valves 4 and 4' open only an amount which is different when a cam stroke is max. Therefore, by adjusting an eccentric shaft 10, valve stroke progress of both this shuttle valve 4 and 4' is changeable so that it may differ mutually.

[0021] When the transfer member 19 reaches by the rocker lever 16 and is formed of the swing lever 17, it becomes extremely reliable structure. This structure has further the advantage of saving space. In order to

lessen friction loss of a moving valve mechanism, rolling friction arises in the contact range between cam 5a and a rocker lever 16, and the contact range between a rocker lever 16 and the swing lever 17. That is, a rocker lever 16 supports roller 16b, and the swing lever 17 is supporting roller 17b.

[0022] Roller 16b of each rocker lever 16 is guided in between both-arms 16c of the rocker lever selectively formed in the shape of 2 arms, and is supported by the roller shaft which was fixed to the arm of this rocker lever and which is not illustrated in detail. Based on the part of a rocker lever 16 which drawing 8 especially shows being formed in the shape of 2 arms, eccentric object 10a attached to this rocker lever 16 is formed of two parts especially for weight relief. That is, the eccentric disk of a proper is prepared for each arm 16c of a rocker lever. In this case, it is the same configuration as well as both the eccentricity disk with which only the width of face of roller 16b was mutually detached, was put in order, and was prepared.

[0023] In itself, the swing lever 17 is equipped with swing lever bearing 17a so that it may be well-known. This swing lever bearing was left and swing lever arm 17c is prolonged to 17d of hold sections. This hold section is supporting the fluid pressure type play compensator 18 which acts on a shuttle valve 4. Roller 17b is prepared in the side of swing lever arm 17c. By this unsymmetrical formation, it becomes very space-saving structure so that drawing 9 may especially show. Roller 17b is similarly supported by the shaft in that case. On the other hand, this shaft is being fixed to swing lever arm 17c by other contiguity arm 17e. This contiguity arm 17e is similarly prolonged from swing lever bearing 17a to 17d of hold sections.

[0024] the same advantage produced when a transfer member is formed of a rocker lever 16 and the swing lever 17 it is reliable and concerning being easy and space-saving structure -- between cam 5a and the transfer members 19 -- and this contact surface when the contact surface in a transfer member is formed with Rollers 16b and 17b -- the crown -- also when formed as a ** or the straight sliding surface, of course, it is generated. Not only structure is easy, but both above equipments have the advantage that there is the highest dependability, in that case. Of course, a majority of other deformation of the structure of the example illustrated especially is possible, without deviating from the content of the claim.

[0025] It is as follows when the advantageous configuration of the moving valve mechanism of the internal combustion engine by this invention is mentioned.

1. Moving valve mechanism of multiple cylinder mold internal combustion engine characterized by establishing eccentric shaft 10 common for cylinders 14a and 14b arranged in the shape of train.

[0026] 2. Moving valve mechanism characterized by forming transfer member 9 as roller 6 which rolls between tappet 7 of shuttle valve 4, and cam 5a, and being shown to it to this roller with gate element 8 which can be adjusted by eccentric object 10a.

[0027] 3. Moving valve mechanism characterized by equipping the roller 6 with different rolling stages 6a, 6b, and 6c which collaborate with gate orbital 8a of cam 5a, a tappet 7, or the gate element 8.

[0028] 4. Moving valve mechanism characterized by returning to a roller 6 and the lever 11 acting.

[0029] 5. Transfer member 19, rocker lever 16 to which 19' is supported by eccentric object 10a and 10a', and acts on swing lever 17 and 17', moving valve mechanism characterized by being formed as 16'.

[0030] 6. Moving Valve Mechanism Characterized by Having at Least One of the Following Descriptions, - The rocker lever 16 selectively formed in the shape of 2 arms is equipped with roller 16b rolling on a cam 5a top. - The eccentric disk of one proper is prepared, respectively for both rocker-levers arm 16c. - Roller 17b by which the swing lever 17 was formed in the side of swing lever arm 17c is supported. The rocker lever 16 acted on this roller, and have extended to 17d of hold sections for play compensator 18 in which swing lever arm 17c supports a shuttle valve 4 from swing lever bearing 17a. - A rocker lever 16 is supported by an internal combustion engine's cylinder head 1 through the pin-slot-guide 20, and slot 20a is prepared in a rocker lever 16 or cylinder head bearing part 20c.

[0031]

[Effect of the Invention] As explained above, the moving valve mechanism of this invention has the advantage that a valve round trip process can be adjusted so that it may differ colorfully and mutually.

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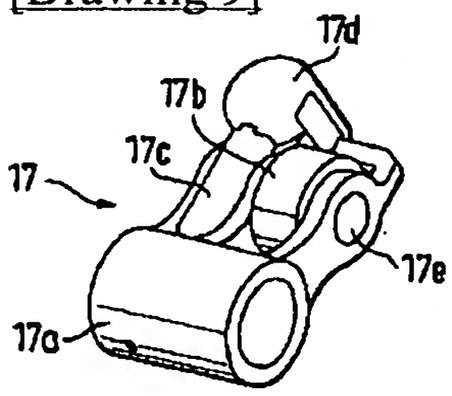
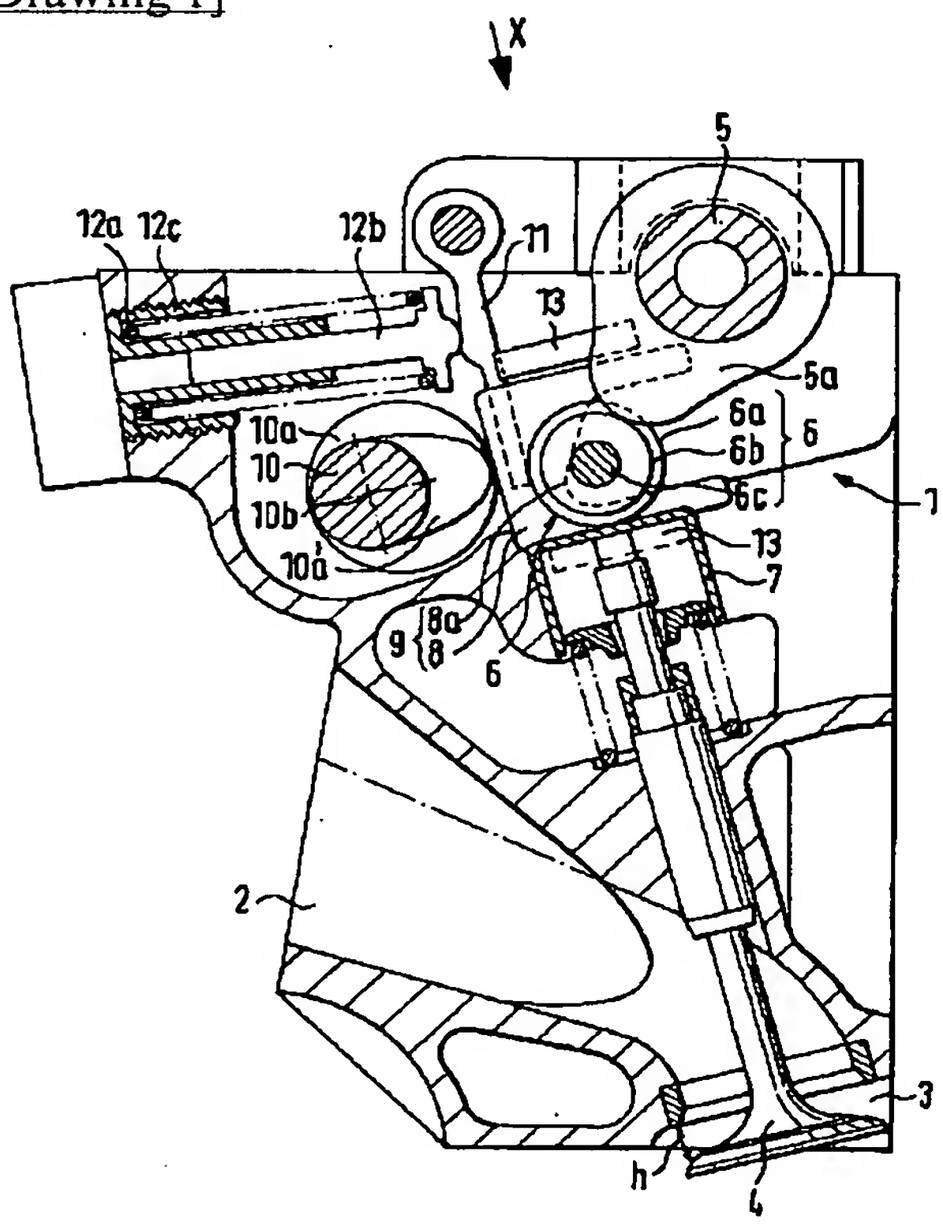
DRAWINGS

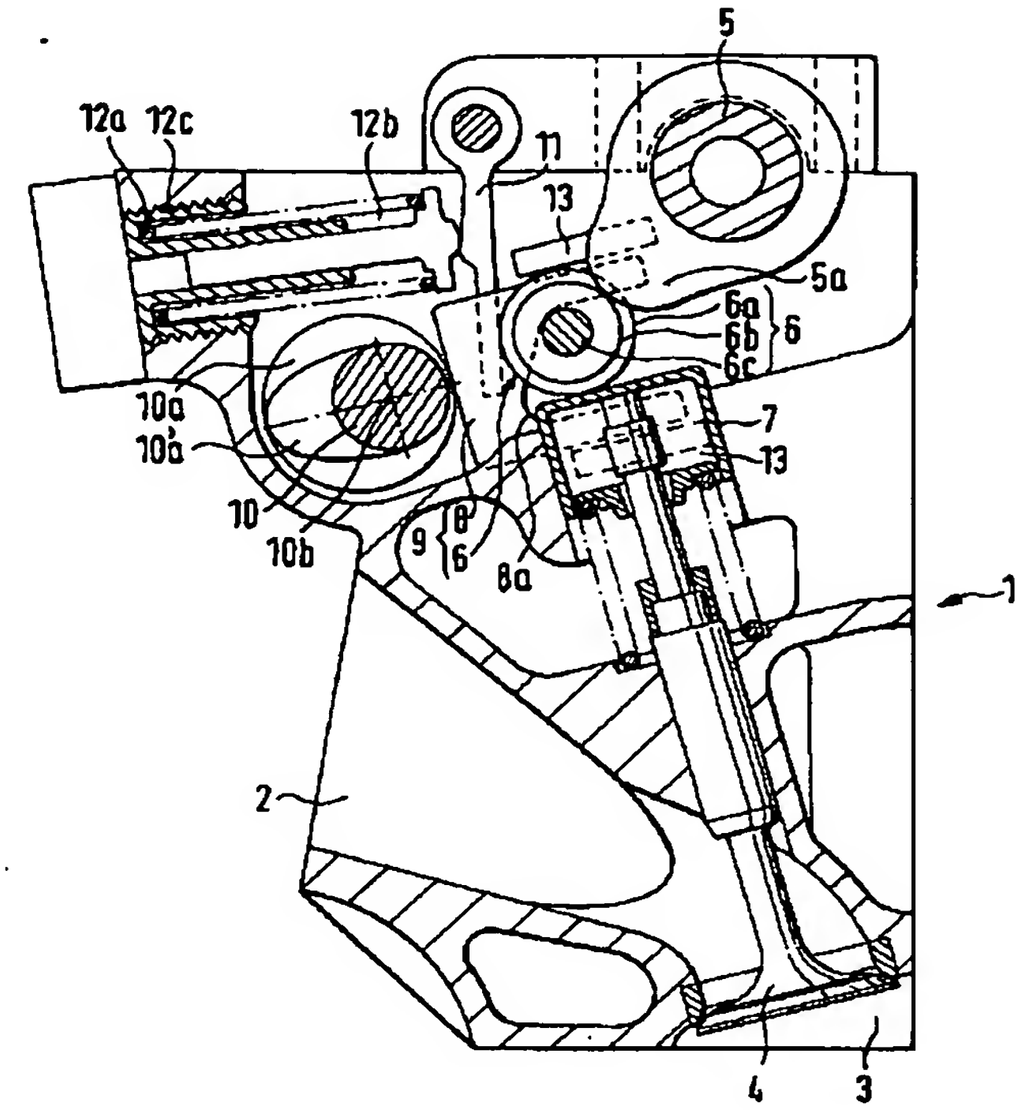
[Drawing 9]



[Drawing 1]



[Drawing 2]



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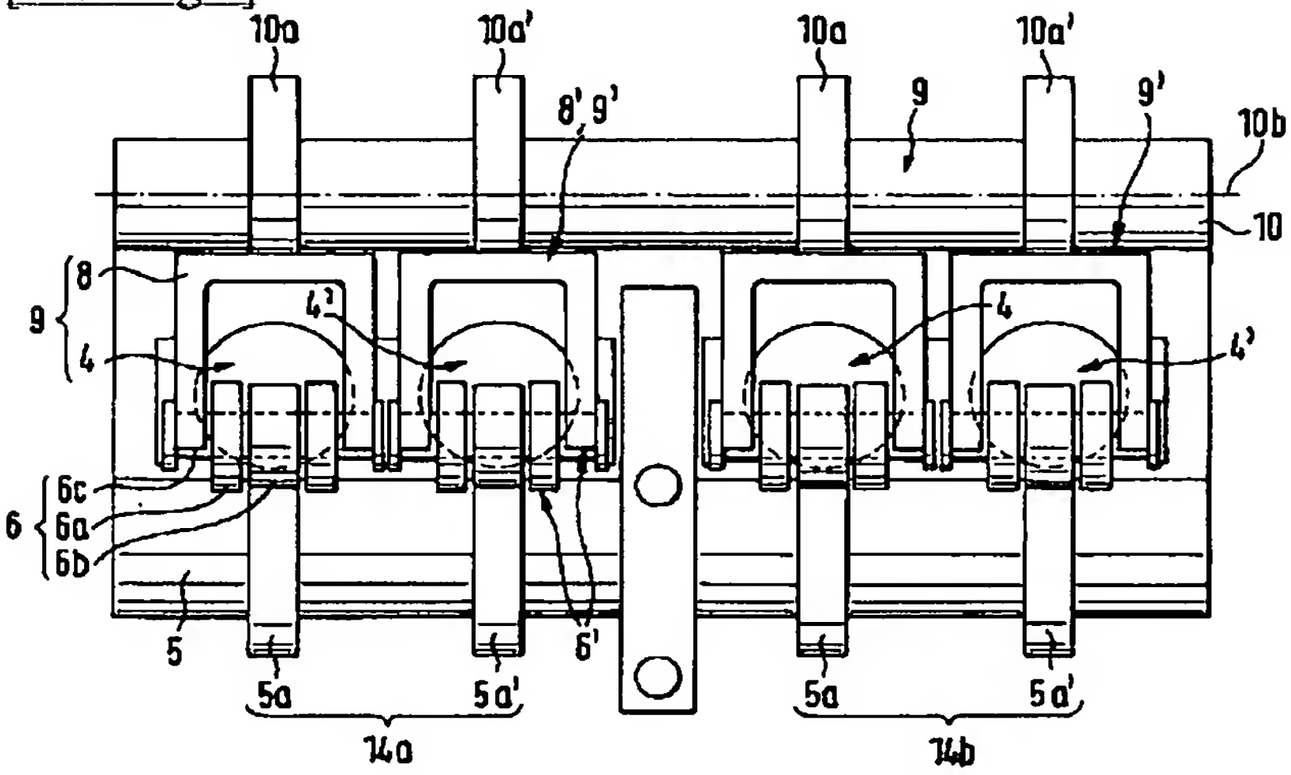

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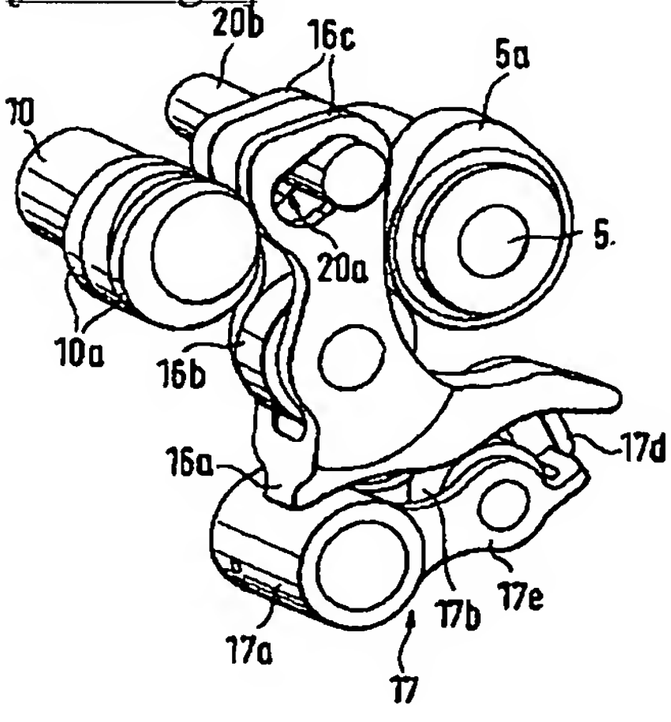

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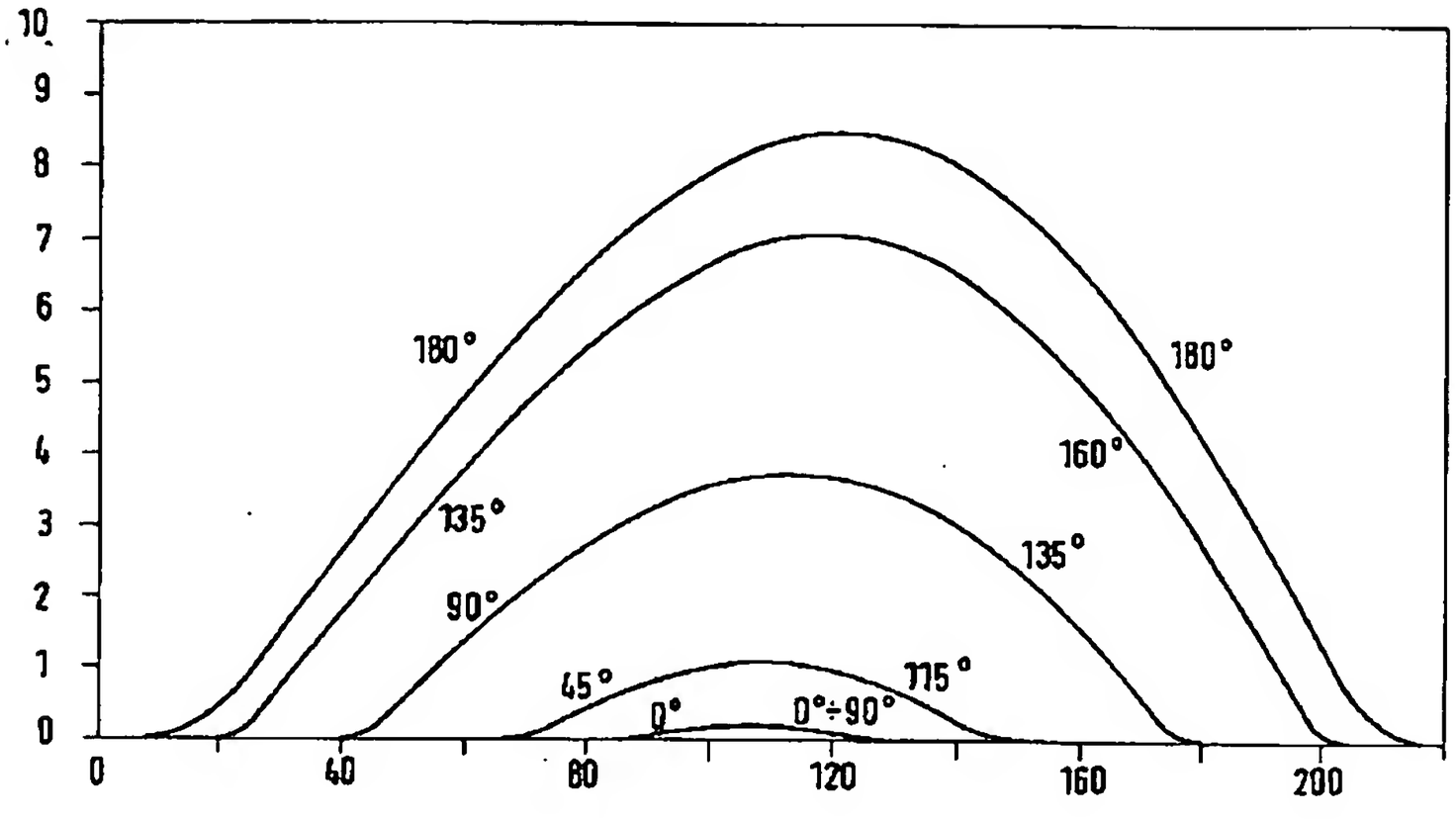
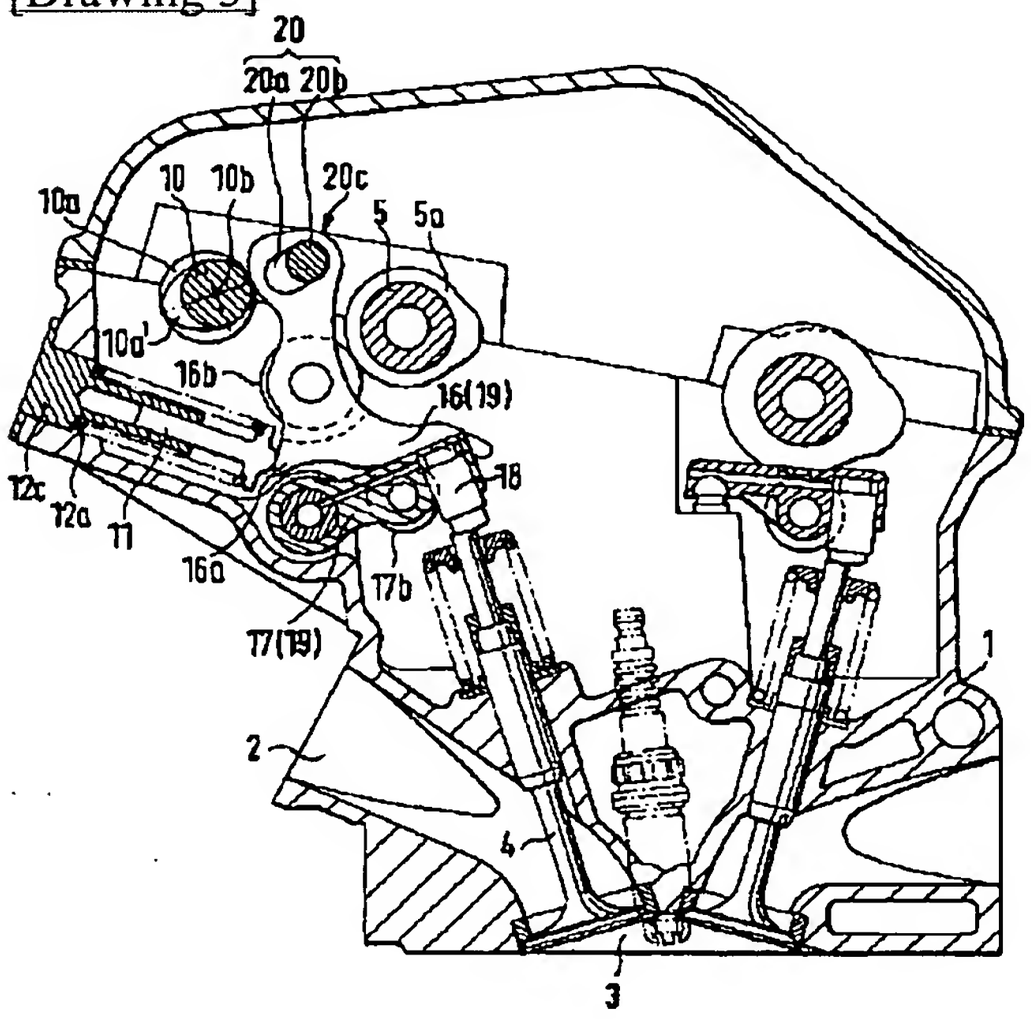
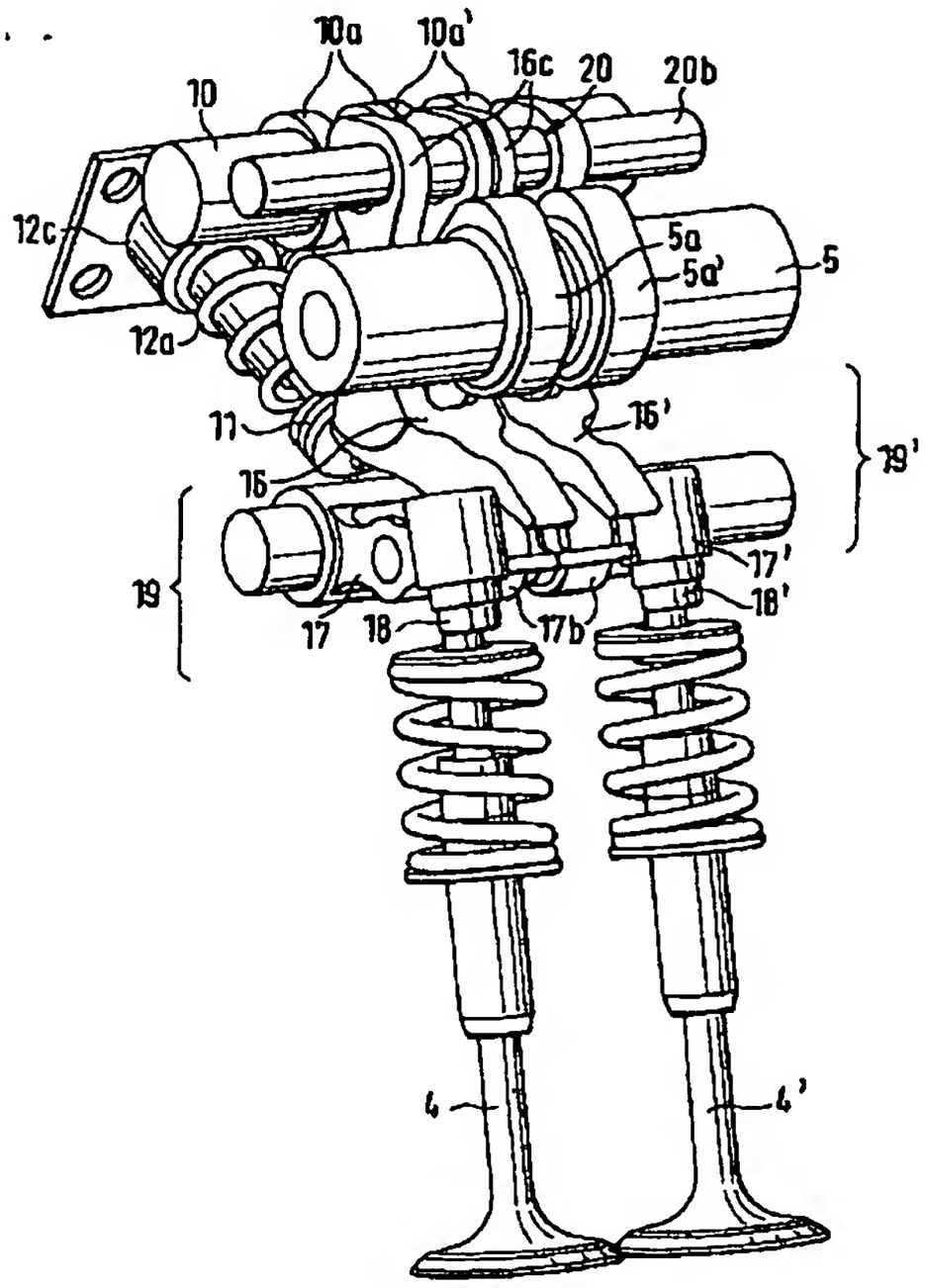


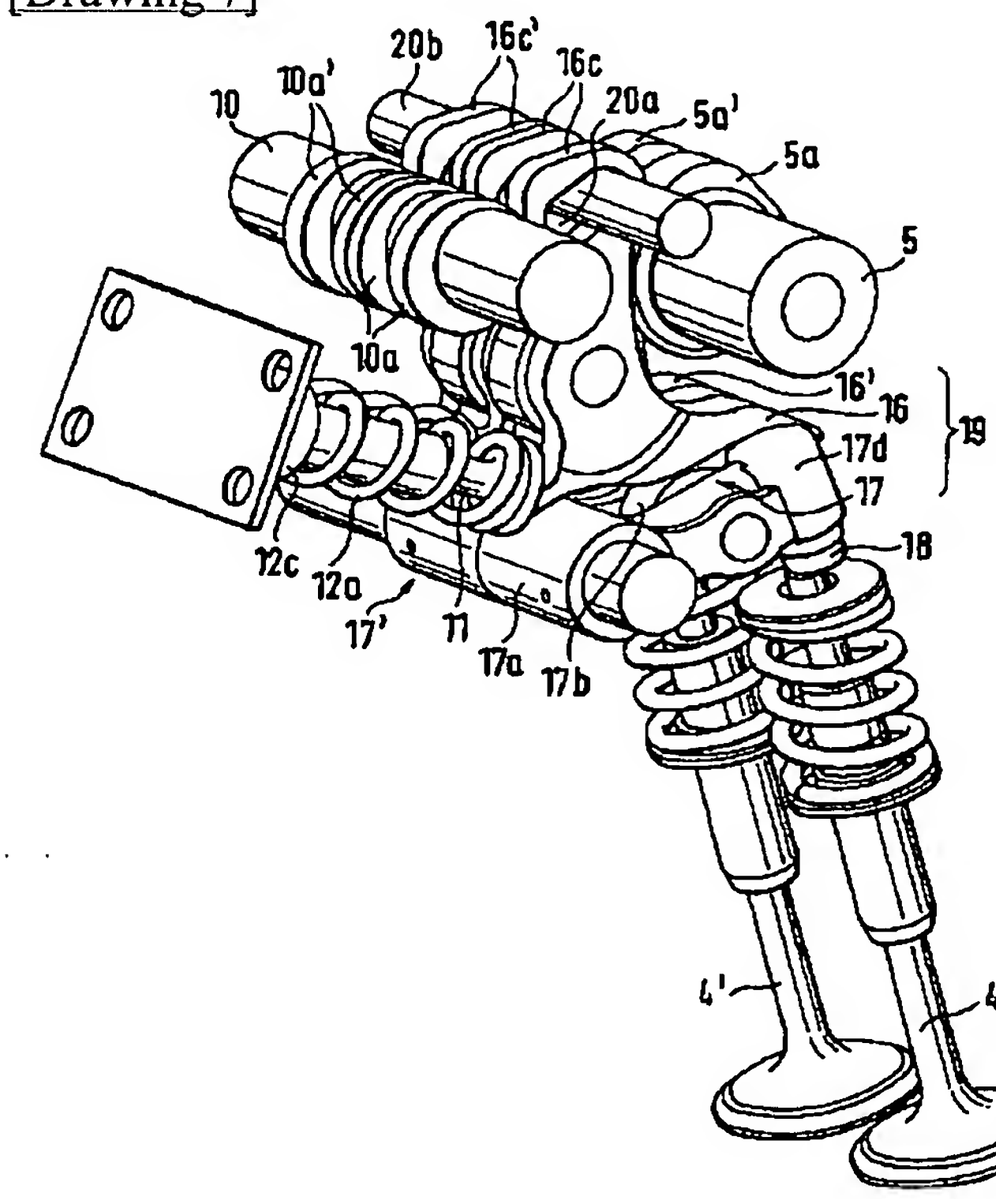
[Drawing 5]



[Drawing 6]



[Drawing 7]



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